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An Analysis of Economic Integration and Antidumping Law

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Abstract

This paper examines the effects of a movement from segmented markets to integrated markets on the volume of trade, consumer prices, and profits in a monopoly model. The monopolist discriminates prices among segmented markets but takes account of arbitrage under integrated markets. The analysis provides interesting insights into economic integration and antidumping law. Surprising results are that neither consumers nor monopolist may gain from economic integration; and that an antidumping suit may benefit consumers at the cost of producers. Whether consumers benefit or not depends on the shape of marginal cost, the curvature of demand curves, the presence of trade tax, and the existence of the third countries.

Key words: monopoly; price discrimination; segmented markets; integrated markets; economic integration; antidumping law
JEL classification: F12, F13

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1 Introduction

A main purpose of economic integration is to achieve an integrated market by removing tariff and non-tariff measures. Thus, economic integration entails a movement from segmented national markets towards a single integrated market. For example, EC has been trying to reduce the extent of market segmentation and move towards an integrated market.

In order to analyze economic integration, thus, it is necessary to explicitly examine such a movement which entails a reduction of trade barriers (if they exist). The purpose of this paper is, taking this point into account, to shed light on the effect of economic integration on markets characterized by imperfect competition. A framework of imperfect competition is necessary because market segmentation is closely related to market power.

Seminal works, Smith and Venables (1988) and Venables (1990), already pointed out in their oligopoly frameworks that both decrease in the extent of market segmentation and reduction in trade barriers lead to significant effects in economic integration. In their analysis, however, they examine these two effects separately. In contrast to these studies, the present study combines these two effects. This allows us to capture an important aspect pointed out by Baldwin and Venables (1995)[1] that the market structure of integrated markets may have the aspects of both segmented and integrated markets.[2]

We specifically make use of a simple monopoly model.[3] Although a monopoly model cannot take account of strategic interactions among firms, it leads to more clear-cut results due to its simplicity. In fact, Smith and Venables (1988) and Venables (1990) depend on numerical simulations, because their models are somewhat complicated.[4]

[1]The literature on economic integration is extensively surveyed in Baldwin and Venables (1995).

[2]Constructing a two-stage model, Venables (1990) incorporates different degrees of market segmentation into Smith and Venables (1988).

[3]Klepper (1992) uses a monopoly model to examine the effect of EC market integration on the pharmaceutical industry. He specifically introduces an arbitrage function to analyze arbitrage between markets. Moreover, Davidson et al. (1989) examine the welfare effects of anti-price-discrimination regulations in the EC car market under monopoly. They are particularly concerned with the comparison between two different regulations with linear demands and costs.

[4]In particular, these models are characterized by product differentiation. Ishikawa (2000) investigates market integration in an oligopoly with a homogeneous good.

The basic structure of our model is as follows. When national markets are segmented, a monopolist discriminates prices among the markets. Once these markets are integrated, arbitrage between markets becomes possible. When setting prices, thus, the monopolist takes account of the arbitrage. We are particularly concerned with how the pricing behavior of the monopolist affects consumer prices.

If there exist no trade barriers in our framework, economic integration forces the monopolist into uniform pricing. Thus, our analysis is closely related to that of third-degree price discrimination.[5] In fact, some aspects investigated in this paper have been analyzed in the literature of third-degree price discrimination. For example, one of our results that neither consumers nor the monopolist may gain from economic integration[6] has been suggested by Hausman and MacKie-Mason (1988) who have examined the relationship between price discrimination and patent policy.

In the presence of trade barriers, however, economic integration does not necessarily lead the monopolist to set a uniform producer price across markets. Our study is in contrast with some other studies such as Smith and Venables (1988) in which economic integration equalizes the producer prices even with trade barriers.[7] That is, the present study is different from the mere analysis of third-price discrimination.

Our viewpoint of economic integration can be applied to the analysis of antidumping law. The traditional view of dumping is basically monopolistic price discrimination among different markets [see Viner (1923), for example]. That is, dumping exists when the domestic monopolist sets a lower price in the foreign country than in the domestic country. Then if the foreign country introduces antidumping law with severe punishment, the monopolist will charge a single price across markets. That is, the monopolist regards two markets as a single integrated market in the presence of antidumping law.[8]

[5]Varian (1989) provides an excellent survey on price discrimination.

[6]Using an oligopoly model with product differentiation, Haaland and Wooton (1992) have obtained a similar result. However, the deriving force of our result is completely different from theirs. The presence of trade costs and national preference biases is crucial in their analysis.

[7]In the literature of trade theory, there are two different notions of market integration. One is the notion used in our study. That is, neither producer nor consumer prices may be equalized in the presence of trade barriers. The other is the notion used in Smith and Venables (1988), where producer prices are always equalized. For details, see Ishikawa (1998).

[8]Anderson et al. (1995) connect market segmentation and integration with antidumping legislation in the framework of duopoly. They focus on the strategic interactions between two governments as well as two firms.

The rest of the paper is organized as follows. Section 2 presents a two-country model. We examine economic integration between two countries both under free trade and in the presence of trade barriers. Section 3, using a three-country model, analyzes the effects of economic integration between two countries. This model allows us to examine the effects on the non-integrated country as well as the robustness of the results obtained in the two-country model. Section 4 briefly presents a model of antidumping law and argues that some of our analyses and results are exactly applicable. Section 5 concludes the paper.

2 Two-country Model

In this section, we consider a world where there exist only two countries or where the good in question is traded between only two countries. We first describe the basic model and then examine the effects of economic integration both under free trade and under trade barrier. Although we specifically consider a tariff as trade barrier in the following,[9] we can interpret it as a different type of trade barrier.[10]

2.1 The Basic Model

There are two countries, country 1 and country 2. In country 1, there exists a monopolist that supplies its product to both countries. The demand function in country i $(i = 1, 2)$ is given by

$$x_i = D_i(p_i); \quad D_i' < 0, \tag{1}$$

where x_i and p_i are, respectively, the demand and consumer price of the good in country i. We define the elasticity of the slope of the inverse demand function for the following analysis:

$$\epsilon_i \equiv \frac{D_i D_i''}{(D_i')^2}. \tag{2}$$

The (inverse) demand curve is concave if $\epsilon_i \leq 0$ and convex if $\epsilon_i \geq 0$.

[9] In the presence of a foreign monopoly, it is well-known that the domestic country can gain from a tariff due to rent-shifting. See Brander and Spencer (1984) and Ishikawa (1998) for details.

[10] In particular, a tariff and a consumption tax are equivalent, because there is no production in the importing country.

We begin with a case where the two markets are segmented. Under the assumption of segmented markets, the monopolist can independently vary prices in each market. Letting superscript S denote segmented markets, the profit function of the monopolist is defined by

$$\Pi^S(P^S;T) = \sum_{i=1}^{n}(p_i^S - t_i)D_i(p_i^S) - C(\sum_{i=1}^{n} D_i(p_i^S)), \tag{3}$$

where P^S and T, respectively, denote the vectors of consumer prices and specific import taxes; and n is the number of countries. In this section, $P^S = (p_1^S, p_2^S)$, $T = (t_1, t_2) = (0, t_2)$ and n=2. $t_2 > 0$ implies that the monopolist faces a specific tariff. $C(.)$ is the cost function with $C' > 0$. MC is increasing (i.e., $C'' > 0$), decreasing (i.e., $C'' < 0$), or constant (i.e., $C'' = 0$). The first-order conditions of the profit maximization are then $(i = 1, 2)$

$$\frac{\partial \Pi^S}{\partial p_i^S} = D_i + (p_i^S - t_i - C')D_i' = 0. \tag{4}$$

We assume that the second-order sufficient conditions are satisfied $(i, j = 1, 2)$:

$$D_i'(2 - \epsilon_i) - C''(D_i')^2 < 0, \tag{5}$$

$$[D_i'(2 - \epsilon_i) - C''(D_i')^2][D_j'(2 - \epsilon_j) - C''(D_j')^2] - (C'' D_i' D_j')^2 > 0 \quad (i \neq j). \tag{6}$$

Noting that $\epsilon_i < 2$ $(i = 1, 2)$ is necessary with $C'' \leq 0$ from (5) and that $\epsilon_i = \epsilon_j = 2$ is not the case from (6), we assume that $\epsilon_i < 2$ always holds in the following. This assumption implies that marginal revenue (MR) curves are always downward-sloping.

Solving the first-order conditions with $T = 0$, we can obtain the supplies under free trade. We let p_i^{Sf} denote the price of country i with free-trade. Then, we have

$$p_i^{Sf} = \frac{\theta_i(p_i^{Sf})}{\theta_i(p_i^{Sf}) - 1} C'(.), \tag{7}$$

where θ_i denotes the price elasticity in country i.[11] Substituting these prices into the demand functions, the supply to each market can be obtained. We let x_i^{Sf} denote the supply to country i under segmented markets with $T = 0$. Similarly, we can obtain the equilibrium prices and supplies with $T \neq 0$, which are denoted by p_i^{St} and x_i^{St}, respectively.

[11] θ_i is not necessarily assumed constant in our analysis. If it is constant, however, $\epsilon_i = 1 + 1/\theta_i$ holds.

We now consider economic integration. Adding up two demand functions, the total demand is given by

$$x^I \equiv x_1^I + x_2^I = D_1(p_1^I) + D_2(p_2^I), \tag{8}$$

where superscript I denotes integrated markets.

Under integrated markets, the profit function is:

$$\Pi^I(P^I;T) = \sum_{i=1}^{n}(p_i^I - t_i)D_i(p_i^I) - C(\sum_{i=1}^{n} D_i(p_i^I)). \tag{9}$$

When setting prices in integrated markets, the monopolist takes account of arbitrage between the markets.[12] That is, the monopolist sets the prices such that arbitrage does not actually arise. Thus, the monopolist maximizes the profits subject to

$$p_1^I \leq p_2^I \leq p_1^I + t_2. \tag{10}$$

2.2 Economic Integration under Free Trade

This subsection examines the effects of economic integration on the volume of trade, consumer prices, and profits in the case where free trade prevails before economic integration. This is the benchmark case in our analysis.

With free trade (i.e., with $p^I \equiv p_1^I = p_2^I$), the first-order condition of the profit maximization is

$$\frac{d\Pi^I}{dp^I} = [D_1 + (p^I - C')D_1'] + [D_2 + (p^I - C')D_2'] = 0 \tag{11}$$

The second-order sufficient condition is assumed to be satisfied:

$$2(D_1' + D_2') + (p^I - C')(D_1'' + D_2'') - C''(D_1' + D_2')^2 < 0. \tag{12}$$

Solving (11), we obtain the price under integrated markets:

$$p^{If} = \frac{\Theta(p^{If})}{\Theta(p^{If}) - 1}C'(.) \quad where \quad \Theta \equiv \lambda\theta_1 + (1-\lambda)\theta_2 \quad and \quad \lambda \equiv \frac{x_1}{x_1 + x_2}. \tag{13}$$

Substituting this price into (1), the supply to each market can be obtained. We let x_i^{If} denote the supply to country i after economic integration (i.e., under integrated markets).

We first show the following lemma:

[12]Under certain conditions, the monopolist stops the supply to one of the two markets. We assume away this possibility. Malueg and Schwartz (1994) explicitly analyze this possibility.

Lemma 1 *Suppose* $p_i^{Sf} \leq p_j^{Sf}$ $(i, j = 1, 2,\ i \neq j)$. *Then* $p_i^{Sf} \leq p^{If} \leq p_j^{Sf}$ *holds with* $C''' \geq 0$.

Proof. We assume $p_1^{Sf} \geq p_2^{Sf}$ without loss of generality in this proof. The lemma is trivial if $p_1^{Sf} = p_2^{Sf}$. Thus, we consider the case where both $p_1^{Sf} > p_2^{Sf}$ and $C''' \geq 0$ hold. We evaluate (11) at p_1^{Sf} and p_2^{Sf}. We can easily see from (4) and (5) that $(d\Pi^I/dp^I)|_{p^I=p_1^{Sf}} < 0$, because the sign of the first bracket is non-positive and that of the second bracket is negative at p_1^{Sf}; and that $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} > 0$, because, at p_2^{Sf}, the sign of the first bracket is positive and that of the second bracket is non-negative. Thus, we obtain $p_2^{Sf} \leq p^{If} \leq p_1^{Sf}$. *Q.E.D.*

With respect to the above proof, the following should be pointed out. If $C''' < 0$ holds instead of $C''' \geq 0$, at p_1^{Sf}, the sign of the second bracket is negative but that of the first bracket can take either sign. Thus, both $(d\Pi^I/dp^I)|_{p^I=p_1^{Sf}} > 0$ and $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} > 0$ could hold. If this is the case, $p^{If} > p_1^{Sf}$ holds. Similarly, $p^{If} < p_2^{Sf}$ holds if both $(d\Pi^I/dp^I)|_{p^I=p_1^{Sf}} < 0$ and $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} < 0$ hold. Since this is shown in Hausman and MacKie-Mason (1988), we just restate the result.[13]

Lemma 2 *Suppose* $p_i^{Sf} < p_j^{Sf}$ $(i = 1, 2,\ i \neq j)$. *If* $C''' < 0$, $p^{If} > p_j^{Sf}$ *or* $p^{If} < p_i^{Sf}$ *may hold.*

It is instructive for the rest of the analysis to see Lemmas 1 and 2 with the aid of Figure 1. R_iR_i in Figure 1 shows the locus of the first-order condition (4) on the price plane. Using the implicit function theorem, the slopes of R_1R_1 and R_2R_2 are, respectively, given by

$$\frac{dp_2}{dp_1}|_{R_1R_1} = \frac{D_1'(2-\epsilon_1) - C'''(D_1')^2}{C'''D_1'D_2'}, \tag{14}$$

$$\frac{dp_2}{dp_1}|_{R_2R_2} = \frac{C'''D_1'D_2'}{D_2'(2-\epsilon_2) - C'''(D_2')^2}. \tag{15}$$

Since the numerator of (14) and the denominator of (15) are negative from the second-order conditions, the signs of the slopes depend only on the sign of C'''. Both loci are downward-sloping with $C''' > 0$ (as in Figure 1 (a)) but are upward-sloping with $C''' < 0$ (as in Figure 1 (b)).[14] The second-order conditions imply that R_1R_1 is steeper than R_2R_2. Moreover, the slopes of iso-profit contours (which surround S) are zero along R_1R_1 and are infinite along R_2R_2.

[13] In fact, Hausman and MacKie-Mason (1988) provide a sufficient condition under which $p^{If} > p_j^{Sf}$ holds.
[14] In general, R_iR_i is not linear. When MC is constant, R_1R_1 is vertical and R_2R_2 is horizontal.

The equilibrium under segmented markets is given by S where the two loci intersect to each other. Figure 1 shows cases with $p_1^{Sf} > p_2^{Sf}$. When the two markets are integrated, a single price arises in the integrated markets. Thus, the equilibrium must be located on the 45 degree line, OZ. The equilibrium is determined by the point, I, where an iso-profit contour is tangent to OZ. In the figure, OZ intersects R_1R_1 at A and R_2R_2 at B. Moreover, OZ intersects the vertical line going through S at C and the horizontal line going through S at D.

Lemma 1 can easily be verified from Figure 1 (a). In the figure, an iso-profit contour is tangent to OZ between A and B. It is obvious that the price indicated by A is lower than p_1^{Sf} while the price indicated by B is higher than p_2^{Sf}. Thus, any point on AB results in $p_2^{Sf} \leq p^{If} \leq p_1^{Sf}$. On the other hand, Lemma 2 can be seen from Figure 1 (b). As in Figure 1 (a), I is located on AB. However, $p^I > p_1^{Sf}$ holds if I is on AC and $p^{If} < p_2^{Sf}$ holds if I is on BD.

$p^{If} > p_1^{Sf}$ or $p^{If} < p_2^{Sf}$ holds only if $C'' < 0$. An economic intuition is that decreasing MC magnifies a decrease or an increase in the total supply which is generated by the inward or outward shift of the MR curve as a result of economic integration.

This is illustrated in Figure 2. In the figure, MR^S is the MR curve under segmented markets. That is, MR^S can be obtained by adding up two MR curves. The total supply under segmented markets is indicated by S where the MR curve intersects the MC curve. Economic integration could shift the MR curve inward (say, MR_A^I) or outward (say, MR_B^I). In particular, as was shown in Robinson (1933), with $p_i^{Sf} < p_j^{Sf}$, economic integration shifts the MR curve inward (resp. outward) if the demand function of country i is strictly convex (resp. concave) and the demand function of country j is concave (resp. strictly convex).[15]

When the MR curve under integrated market is given by MR_A^I, the total supply is smaller with $C'' < 0$ (say, point A') and is larger with $C'' > 0$ (say, point A'') relative to the case with $C'' = 0$ (point A). Similarly, if the MR curve under integrated market is given by MR_B^I, the total supply is larger with $C'' < 0$ (say, B') and is smaller with $C'' > 0$ (say, B'') relative to the case with $C'' = 0$ (point B). If this magnification effect is large enough, $p^{If} > p_j^{Sf}$ arises when economic integration shifts the MR curve inward and $p^{If} < p_i^{Sf}$ arises when it shifts

[15]It has been pointed out that another sufficient condition provided in Robinson (1933) is incorrect. See Shih et al. (1988) for details and alternative conditions.

the MR curve outward.

It is also well-known that MR^S and MR^I happen to coincide with linear demands. Thus, the following lemma is immediate with linear demands,

Lemma 3 *Suppose* $p_i^{Sf} \leq p_j^{Sf}$ $(i, j = 1, 2,\ i \neq j)$ *and the demand functions are linear. Then* $p_i^{Sf} \leq p^{If} \leq p_j^{Sf}$ *holds.*

The following should be noted. First, whenever the consumer price in country 2 rises, the volume of trade decreases. For instance, when $p_1^{Sf} > p_2^{Sf}$, economic integration necessarily reduces the volume of trade with $C'' \geq 0$ or with linear demands. Second, economic integration reduces the profits of the monopolist, because it does not allow the monopolist to discriminate the prices between countries. When both prices rise (which holds only with $C'' < 0$), thus, no one gains from economic integration. Last, decreasing MC is necessary for all consumers to benefit from economic integration in our benchmark case. With non-decreasing MC, consumers in country j gain from economic integration while those in country i lose.

From the above analysis, the following proposition is established:

Proposition 1 *Suppose that countries 1 and 2 initially engage in free trade with* $p_i^{Sf} < p_j^{Sf}$ $(i, j = 1, 2,\ i \neq j)$. *If* $C'' \geq 0$ *or if demands are linear, economic integration makes the consumers in country* j *better off but the consumers in country* i *worse off. If* $C'' < 0$, *however, economic integration may make all the consumers worse off or better off. The monopolist necessarily loses from economic integration. Economic integration may benefit neither consumers nor the monopolist with* $C'' < 0$.

2.3 Economic Integration with Tariff

Next, we examine economic integration in the case where a tariff exists before economic integration, that is, $t_1 = 0$ and $t_2 > 0$ hold before economic integration. Since any change in consumer prices is possible with $C'' < 0$, we focus on the case of $C'' \geq 0$. In particular, it can be shown that economic integration could benefit all consumers even with non-decreasing MC.

In the presence of tariff, the impact of economic integration can be decomposed into two effects. One is the effect of market integration analyzed in the previous subsection (henceforth

the market-integration effect) and the other is the effect of tariff reduction (henceforth the tariff-reduction effect).

We first consider the market-integration effect in the presence of tariff with the aid of Figure 3. In Figure 3, the segmented-market equilibrium with a tariff (i.e., $t_2 > 0$) is given by S^t. Once the markets are integrated (but the tariff remains unchanged), the monopolist maximizes its profits with (10). The constraint (10) is satisfied in the area between the 45 degree line, OZ, and TT which shows the line, $p_2 = p_1 + t_2$. This area is referred to as Region I. Moreover, the area below OZ and the area above TT are, respectively, called Region II and Region III.

Three possible cases are drawn in Figure 3. Figure 3 (a) illustrates a case with $p_1^{St} > p_2^{St}$ and hence S^t is located in Region II. When the markets are integrated, the consumer prices are indicated by point I^t where one of iso-profit contours that surround S^t is tangent to OZ. The shift from S^t to I^t is the market-integration effect. The consumer price falls in country 1 and rises in country 2.

Figures 3 (b) and (c) illustrate cases with $p_1^{St} < p_2^{St}$. S^t is located in Region I in Figure 3 (b) but in Region III in Figure 3 (c). In the case of Figure 3 (b), market integration does not affect the consumer prices, because no arbitrage arises in Region I. That is, I^t coincides with S^t. In the case of Figure 3 (c), market integration shifts the equilibrium consumer prices from S^t to I^t. The consumer price rises in country 1 and falls in country 2.

We should note that market integration equalizes the consumer prices in both countries in Figure 3 (a) and the producer prices in both countries in Figure 3 (c), but neither consumer prices nor producer prices are equalized between the two countries in Figure 3 (b).

Next we consider the tariff-reduction effect. For this, we first analyze the effect of a change in t_2 on prices under segmented markets. We totally differentiate (4) and obtain:

$$\begin{pmatrix} D_1'(2-\epsilon_1) - C''(D_1')^2 & -C''D_1'D_2' \\ -C''D_1'D_2' & D_2'(2-\epsilon_2) - C''(D_2')^2 \end{pmatrix} \begin{pmatrix} dp_1^S \\ dp_2^S \end{pmatrix} = \begin{pmatrix} 0 \\ D_2' \end{pmatrix} dt_2 \tag{16}$$

with the solution

$$\begin{pmatrix} dp_1^S \\ dp_2^S \end{pmatrix} = \frac{1}{\Omega} \begin{pmatrix} D_2'(2-\epsilon_2) - C''(D_2')^2 & C''D_1'D_2' \\ C''D_1'D_2' & D_1'(2-\epsilon_1) - C''(D_1')^2 \end{pmatrix} \begin{pmatrix} 0 \\ D_2' \end{pmatrix} dt_2, \tag{17}$$

where $\Omega \equiv [D_1'(2-\epsilon_1) - C''(D_1')^2][D_2'(2-\epsilon_2) - C''(D_2')^2] - (C''D_1'D_2')^2 > 0$ from (6).

In view of (5), thus, the effects of a change in t_2 on consumer price in each market are given by

$$\frac{dp_1^{St}}{dt_2} = \frac{C'' D_1'(D_2')^2}{\Omega}, \quad \frac{dp_2^{St}}{dt_2} = \frac{[D_1'(2-\epsilon_1) - C''(D_1')^2]D_2'}{\Omega} > 0. \tag{18}$$

Thus, the following lemma is immediate:

Lemma 4 *When the markets of countries 1 and 2 are segmented, a decrease in t_2 lowers consumer price in country 2; and raises the price in country 1 if and only if $C'' > 0$.*

In Figure 3, this corresponds to a downward shift of S^t along R_1R_1. We should note that TT as well as R_2R_2 shifts downward as t_2 falls.

The next task is to examine the effect of a decrease in t_2 under integrated markets. It is trivial that the effect of a decrease in t_2 is the same as that under segmented markets as long as S^t remains in Region I as in Figure 3 (b).

When S^t is located in Region II as in Figure 3 (a), $p_1^I = p_2^I$ holds and hence the profit function (9) is:

$$\Pi_{II}^I(p^I; t_2) = p^I D_1(p^I) + (p^I - t_2)D_2(p^I) - C(D_1(p^I) + D_2(p^I)), \tag{19}$$

where subscript II denotes Region II. Then the first-order condition of the profit maximization is

$$\frac{d\Pi_{II}^I}{dp^I} = (D_1 + D_2) + D_1'(p^I - C') + D_2'(p^I - t_2 - C') = 0. \tag{20}$$

The second-order sufficient condition is assumed to be satisfied:

$$2(D_1' + D_2') + D_1''(p^I - C') + D_2''(p^I - t_2 - C') - C''(D_1' + D_2')^2 \equiv \Gamma_{II} < 0. \tag{21}$$

Using the implicit function theorem, the effect on the consumer price is given by

$$\frac{dp^{It}}{dt_2} = -\frac{\partial^2 \Pi_{II}^I / \partial p^I \partial t_2}{\partial^2 \Pi_{II}^I / (\partial p^I)^2} = \frac{D_2'}{\Gamma_{II}} > 0. \tag{22}$$

Thus, a decrease in t_2 lowers the consumer price and raises the total supply. It should be noted that this is the case even with $C'' = 0$. This is in contrast to the case under segmented markets. In Figure 3 (a), as t_2 falls, S^t and I^t, respectively, move downward along R_1R_1 and OZ.

Using the envelop theorem, we can obtain the effect of a decrease in t_2 on the profits:

$$\frac{d\Pi^I_{II}}{dt_2} = \frac{\partial \Pi^I_{II}}{\partial t_2} = -D_2 < 0. \tag{23}$$

This implies that the monopolist gains from a decrease in t_2.

Lemma 5 *When S^t is in Region II, $p_1^{It} = p_2^{It} (\equiv p^{It})$ holds. A decrease in t_2 lowers p^{It} and raises the total supply and the profits of the monopolist.*

When S^t is located in Region III as in Figure 3 (c), $p_1^I + t_2 = p_2^I$ holds and hence the profit function (9) is:

$$\Pi^I_{III}(p_1^I; t_2) = p_1^I[D_1(p_1^I) + D_2(p_1^I + t_2)] - C(D_1(p_1^I) + D_2(p_1^I + t_2)), \tag{24}$$

where subscript III denotes Region III. The first-order condition of the profit maximization is

$$\frac{d\Pi^I_{III}}{dp_1^I} = (D_1 + D_2) + (p_1^I - C')(D_1' + D_2') = 0. \tag{25}$$

The second-order sufficient condition is assumed to be satisfied:

$$\begin{aligned} &2(D_1' + D_2') + (p_1^I - C')(D_1'' + D_2'') - C''(D_1' + D_2')^2 \\ &= 2(D_1' + D_2') - \frac{D_1 + D_2}{D_1' + D_2'}(D_1'' + D_2'') - C''(D_1' + D_2')^2 \equiv \Gamma_{III} < 0, \end{aligned} \tag{26}$$

where the equality is obtained from the first-order condition (25).

Since both S^t and TT shift downward as t_2 falls, the effects of a decrease in t_2 on the consumer prices are somewhat complicated. Using the implicit function theorem, the effect on p_1 (i.e., the producer price) is given by

$$\frac{dp_1^{It}}{dt_2} = -\frac{\partial^2 \Pi^I_{III}/\partial p_1^I \partial t_2}{\partial^2 \Pi^I_{III}/(\partial p_1^I)^2} = -\frac{D_2'[1 - (D_1' + D_2')C''] - D_2''(D_1 + D_2)/(D_1' + D_2')}{\Gamma_{III}}. \tag{27}$$

Noting the second-order condition (26) (i.e., $\Gamma_{III} < 0$), we obtain the following condition:

$$\frac{dp_1^{It}}{dt_2} \gtrless 0 \Leftrightarrow D_2'' \gtrless \frac{D_2'(D_1' + D_2')[1 - (D_1' + D_2')C'']}{D_1 + D_2}. \tag{28}$$

This implies that a decrease in t_2 may or may not raise p_1^{It}. A sufficient condition for $dp_1^{It}/dt_2 < 0$ is $D_2'' \leq 0$. That is, if the demand function in country 2 is concave, a decrease in t_2 raises p_1^{It}.

The effect of a change in t_2 on p_2^{It} is given by

$$\frac{dp_2^{It}}{dt_2} = \frac{d(p_1^{It} + t_2)}{dt_2} = \frac{(2D_1' + D_2') - D_1'(D_1' + D_2')C'' - D_1''(D_1 + D_2)/(D_1' + D_2')}{\Gamma_{III}}. \quad (29)$$

Thus, we have

$$\frac{dp_2^{It}}{dt_2} \gtreqless 0 \Leftrightarrow D_1'' \lesseqgtr \frac{(D_1' + D_2')[(2D_1' + D_2') - D_1'(D_1' + D_2')C'']}{D_1 + D_2}. \quad (30)$$

When the demand function of country 1 is concave (i.e., $D_1'' \leq 0$), p_2^{It} falls. Moreover, if $dp_1^{It}/dt_2 > 0$, then $dp_2^{It}/dt_2 > 0$ also holds.

A change in the total output is given by

$$\frac{d(x_1^{It} + x_2^{It})}{dt_2} = (D_1' + D_2')\frac{dp_1^{It}}{dt_2} + D_2' = \frac{(D_1 + D_2)(D_1'D_2'' - D_1''D_2') + D_2'(D_1' + D_2')^2}{(D_1' + D_2')\Gamma_{III}}. \quad (31)$$

The second term of the numerator is negative but the first term takes either sign. If the first term is positive, the sign of (31) could be positive. This is likely to arise when D_2'' is small (i.e., the demand function in country 2 is very concave) and D_1'' is large (i.e., the demand function in country 1 is very convex). If the demand functions are linear, a decrease in t_2 increases the supply to country 2 but decreases the supply to country 1. Nevertheless the total supply rises.

Using the envelop theorem and (25), we can obtain the effect of a decrease in t_2 on the profits:

$$\frac{d\Pi_{III}^I}{dt_2} = \frac{\partial \Pi_{III}^I}{\partial t_2} = -\frac{D_2'(D_1 + D_2)}{D_1' + D_2'} < 0. \quad (32)$$

Thus, the monopolist gains from a decrease in t_2.

Lemma 6 *When S^t is in Region III, $p_1^{It} + t_2 = p_2^{It}$ holds. A decrease in t_2 raises p_1^{It} if the demand function of country 2 is concave; lowers p_2^{It} if the demand function of country 1 is concave; decreases the total supply if the demand function of country 2 is convex and the demand function of country 1 is concave; and increases the profits of the monopolist.*

The following should be remarked. Since both S^t and TT shift downward as t_2 falls, S^t could move from one region to others. Obviously, this shift occurs only if S^t is located in either Region I or Region III. If the downward shift of TT is less than the downward shift

of S^t, S^t in Region III may move to Region I and S^t in Region I may move to Region II. If the downward shift of TT is greater than the downward shift of S^t, on the other hand, S^t in Region I could move to Region III.

Whether the downward shift of TT is less or greater than that of S^t may be seen from the sign of the following:

$$1 - \frac{dp_2^S}{dt_2} = 1 - \frac{[D_1'(2-\epsilon_1) - C''(D_1')^2]D_2'}{\Omega} \tag{33}$$

A decrease in p_2^{St} is greater than a decrease in t_2 with negative sign and is less than that with positive sign.

Figure 3 (b) shows a case where S^t is Region I but S^f is in Region II. This implies that S^t eventually moves to Region II as t_2 falls. In Figure 3 (c), both S^t and S^f are in Region III. This implies that S^t remains in Region III or moves to Region I and then back to Region III.

We now combine the market-integration effect with the tariff-reduction effect. That is, we compare the consumer prices before economic integration (which are indicated by S^t in Figure 3) with those after economic integration (denoted by $\bar{I}$ that is not shown in Figure 3).[16] If both $p_1^{Sf} > p_2^{Sf}$ and $p_1^{St} > p_2^{St}$ hold as in Figure 3 (a), then p_1 falls but p_2 may or may not rise. In Figure 3 (a), economic integration makes p_2 higher relative to market segmentation if $\bar{I}$ is located between I^t and A and lower if $\bar{I}$ is located between A and O. If $p_1^{Sf} > p_2^{Sf}$ but $p_1^{St} < p_2^{St}$ hold as in Figure 3 (b), p_2 falls but p_1 may or may not rise.[17] In Figure 3 (b), economic integration makes p_1 higher relative to market segmentation if $\bar{I}$ is located between I^t and A and lower if $\bar{I}$ is located between A and O. If both $p_1^{Sf} < p_2^{Sf}$ and $p_1^{St} < p_2^{St}$ hold as in Figure 3 (c), then p_1 rises but p_2 falls.

The following should be pointed out. First, when S^f is in Region II, $p^{It} < min[p_1^{St}, p_2^{St}]$ could be the case even with $C'' > 0$. This does not arise without tariff. Moreover, the monopolist could gain from economic integration, because the market-integration effect has a non-positive impact on the profits of the monopolist while the tariff-reduction effect has a positive effect. Thus, both monopolist and all the consumers could gain from economic integration.

[16] $\bar{I}$ coincides with I^t if the tariff is not reduced at all and with I^f if the tariff is completely removed.
[17] With $C'' = 0$, p_1 never rises.

Second, economic integration could result in $p_2^{It} > p_2^{St}$ and hence less volume of trade regardless of the reduction of tariff. Although the tariff-reduction effect always increases the exports to country 2, the market-integration effect may decrease the export. A decrease in the volume of trade arises only if both S^f and S^t are located in Region II as in Figure 3 (a).

Third, although the tariff-reduction effect may change both consumer prices in the same direction in the case of Figure 3 (c) (see (28) and (30)), the total effect is an increase in p_1 and a decrease in p_2. This is because $\bar{I}$ is necessarily located above R_1R_1 but below R_2R_2.

The following proposition summarizes the effects on the monopolist and consumers.

Proposition 2 *Suppose that $C'' \geq 0$ and that country 2 initially imposes a tariff. The consumers in country 1 necessarily lose from economic integration with $p_1^{Sf} \leq p_2^{Sf}$; and may lose even with $p_1^{Sf} > p_2^{Sf}$. The consumers in country 2 necessarily gain if $p_1^{St} \leq p_2^{St}$; and may gain if $p_1^{St} > p_2^{St}$. Economic integration could make all the consumers better off with $p_1^{Sf} > p_2^{Sf}$; and may benefit the monopolist. In particular, both monopolist and all the consumers could gain from economic integration.*

3 Three-country Model

3.1 Economic Integration under Free Trade

In this section, we consider a case where there exist three countries (country 1, country 2 and country 3) and countries 1 and 2 form economic integration. The three-country model allows us to examine not only the robustness of the results in the two-country model but also the effects on the non-integrated country.

The demand function of country i ($i = 1, 2, 3$) is given by (1). The monopolist that supplies its product to all the countries exists in one of the three countries. Under segmented markets, the profit function (3) and the first-order conditions (4) remain unchanged. However, the second-order conditions require another condition in addition to (5) and (6). Defining the following matrix,

$$A \equiv \begin{pmatrix} D_1'(2-\epsilon_1) - C''(D_1')^2 & -C''D_1'D_2' & -C''D_1'D_3' \\ -C''D_2'D_1' & D_2'(2-\epsilon_2) - C''(D_2')^2 & -C''D_2'D_3' \\ -C''D_3'D_1' & -C''D_3'D_2' & D_3'(2-\epsilon_3) - C''(D_3')^2 \end{pmatrix} \tag{34}$$

the condition is $|A| < 0$.

Appendix shows that Lemmas 1 and 2 are still valid in the three-country model. It should be noted, however, that there is a big difference between the two-country model and the three-country model. This difference can intuitively be seen with the aid of Figure 1. In the two-country model, the market integration affects neither R_1R_1 nor R_2R_2, while, in the three-country model, it shifts both R_1R_1 and R_2R_2 through changes in MC that is caused by a change in p_3. In Figure 1 (a), I is between A and B in the two-country model, but it could be on AC or BD in the three-country model. As is shown in Appendix, the following lemma, which is useful for the analysis with tariff, holds.

Lemma 7 *In Figure 1 (a), point I is between A and C if $(x_1 + x_2)$ at A is larger than that at S; and is between B and D if $(x_1 + x_2)$ at B is smaller than that at S.*

Lemma 3 is also valid here, because the presence of the third country does not affect the demand and MR curves of countries 1 and 2. That is, with linear demands, $p_i^{Sf} \leq p^{If} \leq p_j^{Sf}$ $(i, j = 1, 2; i \neq j)$ holds and economic integration does not change the total supply to countries 1 and 2.

Unless the supply to country 3 remains unchanged, economic integration affects the consumers in country 3. It is obvious that the consumers in country 3 gain if the supply to country 3 rises but lose if it falls. It can be seen from (4) that a decrease (resp. an increase) in $(x_1 + x_2)$ implies a decreases (resp. an increase) in x_3 with $C'' < 0$ but an increase (resp. a decrease) in x_3 with $C'' > 0$. In particular, with $C'' < 0$ (resp. $C'' > 0$), the consumers in country 3 lose (resp. gain) if $p^{If} > max[p_1^{Sf}, p_2^{Sf}]$; and gain (resp. lose) if $p^{If} < min[p_1^{Sf}, p_2^{Sf}]$. With $C'' < 0$, thus, the consumers in the non-integrated country lose from economic integration whenever all the consumers in the integrated countries lose; and gain whenever all the consumers in the integrated countries gain.

We should note in Figure 2 that $(x_1 + x_2)$ rises if MR^I is located outside of MR^S and falls if MR^I is located inside of MR^S; and that it is a possible outcome that economic integration decreases the volume of trade with the integrated country but increases that with the non-integrate country. Moreover, as in the previous section, economic integration under free trade necessarily harms the monopolist. With $C'' < 0$, thus, no one may gain.

The following proposition can be established from the above analysis:

Proposition 3 *Suppose that countries 1, 2 and 3 initially engage in free trade with $p_i^{Sf} <$*

p_j^{Sf} $(i, j = 1, 2,\ i \neq j)$. *If* $C'' \geq 0$ *or if demands are linear, economic integration between countries 1 and 2 harms the consumers in country* i *but benefits the consumers in country* j. *If not, the consumers in both countries 1 and 2 may gain or lose simultaneously. When the economic integration increases (resp. decreases) the total supply to countries 1 and 2 (i.e.,* $x_1 + x_2$*), the consumers in country 3 gain (resp. lose) if and only if* $C'' < 0$ *and lose (resp. gain) if and only if* $C'' > 0$. *In particular, with* $C'' < 0$, *the consumers in country 3 lose if consumers in both countries 1 and 2 lose; and gain if consumers in both countries 1 and 2 gain. With* $C'' < 0$, *economic integration may benefit neither the monopolist nor any consumer.*

3.2 Economic Integration with Tariff

In this subsection, we consider economic integration between countries 1 and 2 when there initially exist tariffs. We consider two cases in the following. The monopolist is in country 1 in the first case and in country 3 in the second case. Since the analysis with tariff is somewhat complicated in the three-country model, we focus on the full integration (that is, the case where the tariff is completely eliminated and the monopolist sets a single price among integrated markets) with $C'' \geq 0$ in the following.

As in the two-country model, we decompose the effect of economic integration into two effects: the market-integration effect and the tariff-elimination effect.[18] To examine the tariff-elimination effect, we consider the effects of a change in tariff under segmented markets. For this, we totally differentiate (4) and obtain:

$$\begin{pmatrix} dp_1^S \\ dp_2^S \\ dp_3^S \end{pmatrix} = A^{-1} \begin{pmatrix} D_1' dt_1 \\ D_2' dt_2 \\ D_3' dt_3 \end{pmatrix}. \tag{35}$$

Thus, the effects of a change in t_i on p_i^{St} and p_j^{St} $(i, j, k = 1, 2, 3$ and $i \neq j \neq k \neq i)$ are given by

$$\frac{dp_i^{St}}{dt_i} = \frac{D_i'}{|A|}\{[D_j'(2 - \epsilon_j) - C''(D_j')^2][D_k'(2 - \epsilon_k) - C''(D_k')^2] - (C'' D_j' D_k')^2\} > 0. \tag{36}$$

[18] Since the full integration is considered, we use a term "tariff-elimination" instead of "tariff-reduction".

$$\frac{dp_j^{St}}{dt_i} = \frac{1}{|A|}\{C''(D_i')^2 D_j' D_k'(2-\epsilon_k)\}. \tag{37}$$

Moreover, applying the envelop theorem to (3), we can obtain the effect of a decrease in t_i on the profits:

$$\frac{d\Pi^S}{dt_i} = \frac{\partial \Pi^S}{\partial t_2} = -D_i < 0. \tag{38}$$

From above, the following lemma obtains:

Lemma 8 *When all the three markets are segmented, a decrease in t_i lowers the consumer price in country i; raises the consumer price in the other countries if and only if $C'' > 0$; and increases the profits.*

We first examine the case where the monopolist is in country 1 with $t_2 > 0$ and $t_3 \geq 0$. For simplicity, we assume that economic integration does not affect t_3. This assumption particularly implies that the level of t_3 does not qualitatively matter in the following analysis.

We now combine the tariff-elimination effect with the market-integration effect. To examine the full integration, it is easier to consider the tariff-elimination effect first and then the market-integration effect. From Lemma 8, the tariff-elimination effect leads to $p_1^{Sf} \geq p_1^{St}$ and $p_2^{Sf} < p_2^{St}$. If $p_1^{Sf} \leq p_2^{Sf}$, then $p_1^{St} \leq p^{If} < p_2^{St}$ holds. That is, economic integration benefits the consumers in country 2 but does not benefit consumers in country 1. If $p_1^{Sf} > p_2^{Sf}$, on the other hand, the effect of economic integration on the consumer prices in countries 1 and 2 are not straightforward. In particular, noting Lemmas 7 and 8, $p^{If} > max[p_1^{St}, p_2^{St}]$ as well as $p^{If} < min[p_1^{St}, p_2^{St}]$ may arise even with $C'' > 0$. We should recall that in the two-country model, $p^{If} > max[p_1^{St}, p_2^{St}]$ never arises with $C'' \geq 0$. The presence of the third country makes this result possible.

The case with $p_1^{Sf} > p_2^{Sf}$ and $C'' > 0$ is illustrated in Figures 4 (a) and (b).[19] In Figure 4 (a), $p_1^{St} > p_2^{St}$ holds, while in Figure 4 (b), $p_1^{St} < p_2^{St}$ holds.[20] In the figure, the tariff-elimination effect is shown by the shift from S^t to S^f. The market-integration effect is given by the shift from S^f to I^f which is not shown but must be on AB from Lemma 1. In Figure

[19]It is not very useful to draw R_1R_1 and R_2R_2 in Figure 4, because they shift whenever p_3 changes with $C'' > 0$.

[20]In Figure 4 (b), A and B could be located between C and D. This case is similar to Figure 4 (c) explained below.

4 (a) (resp. (b)), economic integration leads the consumers in countries 1 and 2 to face the higher price if I^f is located between A and C (resp. D) and the lower price if I^f is located between B and D (resp. C). If I^f is located between C and D, on the other hand, the consumer price in country 1 falls (resp. rises) but that in country 2 rises (resp. falls) in Figure 4 (a) (resp. (b)).

Similarly, the case with $p_1^{Sf} > p_2^{Sf}$ and $C'' > 0$ is drawn in Figure 4 (c). Economic integration is given by the shift from S^t to I^f which must be on AB. Noting that the tariff-elimination effect and the market-integration effect work in the same direction, the consumer price falls in country 2 but rises in country 1.

With $C'' = 0$, it is obvious that economic integration leads to no effect on country 3. With $C'' > 0$, the effect on the consumer price in country 3 depends on how the tariff-elimination and market-integration effects act. When $p^{If} > max[p_1^{St}, p_2^{St}]$ holds, p_3 falls and hence the consumers in country 3 necessarily gain from the full integration. In this case, economic integration decreases the volume of trade between the integrated-countries but increases that between the integrated country (i.e. country 1) and the non-integrated country. When $p^{If} < min[p_1^{St}, p_2^{St}]$, the consumers in country 3 necessarily lose. When p^{If} is between p_1^{St} and p_2^{St}, the consumers in country 3 gain if the total supply to countries 1 and 2 falls and lose if it rises. With $C'' \geq 0$, thus, the full economic integration cannot make all the consumers better off simultaneously.

The effects on consumer prices are summarized in the following proposition:

Proposition 4 *Suppose that imports to country 2 are initially taxed and then countries 1 and 2 are fully integrated. With $C'' \geq 0$, consumers in country 2 gain but consumers in country 1 lose if $p_1^{Sf} < p_2^{Sf}$; and consumers in countries 1 and 2 may gain or lose simultaneously if $p_1^{Sf} > p_2^{Sf}$. With $C'' > 0$, consumers in country 3 lose (resp. gain) if economic integration increases (resp. decreases) the total supply to countries 1 and 2. With $C'' = 0$, there is no effect on country 3. With $C'' \geq 0$, economic integration never makes all the consumers worse off or better off simultaneously.*

Next we consider a case where the monopolist is in country 3. Here we briefly examine a free trade area between countries 1 and 2. In this subsection, free trade area specifically means that there is no tax on trade among member countries, but each member country

imposes its own tariff on imports from non-member countries. For simplicity, we assume countries 1 and 2 do not change their tariff levels when they form a free trade area. Without loss of generality, we also assume $0 < t_1 < t_2$.

When the free trade area is formed with $0 < t_1 < t_2$, the monopolist supplies its product to the area entirely through the exports to country 1 and stops the direct exports to country 2. That is, the free trade area is just like a single country with a single tariff, t_1. Thus, the effects of the creation of the free trade area on the volume of trade, consumer prices and profits can be decomposed into two effects. One is the tariff-reduction effect in country 2 from t_2 to t_1 under segmented markets, which is basically the same as the tariff-elimination effect given by Lemma 8. The other is the market-integration effect in the presence of the tariff, t_1, which is qualitatively identical to the market-integration effect without any tariff. Thus, the effects on consumer prices are the same as those in the case where the monopolist is in country 1 and hence Proposition 4 is still valid here.[21] It should be noted that the formation of the free trade area may or may not lower the imports from the non-member country, because the tariff reduction of country 2 has a positive impact on the volume of trade but the market integration has an ambiguous impact.

It should be pointed out that the effects of a customs union on the volume of trade, consumer prices and profits are actually similar to those of a free trade area. If the common tariff is set at t_1, then the effects are in fact identical to those above. However, a difference arises in the welfare effect on integrated countries. In the case of free trade area, country 2 cannot raise any tariff revenue.[22] In the case of customs union, on the other hand, it could be a big issue how the tariff revenue is divided between member countries.

4 Alternative Interpretation: Antidumping Law

So far, we have interpreted the movement from segmented markets to integrated markets as economic integration. This section briefly discusses that a similar situation could arise under antidumping law. In fact, we can reinterpret some of the above analyses and results

[21] Strictly speaking, p_i^{Sf} should be regarded as the consumer price with the tariff, t_1.

[22] Country 2 may introduce rules of origin to raise the tariff revenue when the free trade area is formed. If the rules are strict in the sense that the arbitrage between countries 1 and 2 is impossible at all, the creation of the free trade area without changes in tariff levels does not affect the initial equilibrium at all.

without any modification in the presence of antidumping law.

The basic framework is as follows.[23] There is a single monopolist in country 1, while there are competitive firms in country 2. They produce a homogeneous good. The supply curve of the country 2 is upward sloping and the producers' surplus of competitive firms is positive whenever they sell the good. There exists prohibitively high import barriers in country 1 and hence the market of country 1 is segmented from that of country 2. That is, the monopolist can supply its product to both markets, while the competitive firms in country 2 cannot sell in country 1.

In country 2, the monopolist has the dominant market position relative to firms in the competitive fringe. In the market of country 2, thus, the monopolist behaves as a Stackelberg leader in its price setting. Facing the import demand function of country 2, the monopolist chooses the price. Observing the price, the competitive firms set their price. Obviously, they set the same price as the monopolist. For country 2, thus, (1) should be reinterpreted as the import demand function.

In the absence of antidumping law, the monopolist can freely choose the prices in both markets. If antidumping law with severe punishment is introduced in country 2, this imposes a constraint on monopolist's behavior. Whenever the price in country 2 is lower than that in country 1, the industry in country 2 will file an antidumping petition and the monopolist is punished. If $p_2^{Sf} < p_1^{Sf}$, thus, the presence of antidumping law constrains the monopolist to equate the price in country 2 with that in country 1. That is, in this situation, the monopolist regards the markets of countries 1 and 2 as if they are integrated.

Obviously, the analyses and results under economic integration under free trade can be applied here without any modification. With $C''' \geq 0$, antidumping law benefits the producers in country 2 at the cost of the monopolist and the consumers in country 2. We should note that the consumers in country 1 also gain. Interestingly, however, all the consumers could gain at the cost of all the producers with $C''' < 0$. It is also possible that the only producers in country 2 gain with $C''' < 0$.

In the above, the effects of antidumping law are examined under free trade. It is not difficult to incorporate trade tax into the analysis. In the presence of trade tax, antidumping

[23]The basic structure is similar to Staiger and Wolak (1992) that analyzes capacity choice of the monopolist with antidumping law and uncertainty.

law forces the monopolist to set a single producer price. However, this would not affect the result qualitatively.

5 Concluding Remarks

We have examined the effects of the movement from segmented markets toward integrated markets in the framework of monopoly. The monopolist discriminates prices among segmented markets but takes account of arbitrage under integrated markets. This paper particularly combines the tariff-reduction effect with the market-integration effect. Without tariff, the monopolist sets a single price in the integrated markets. With tariff, however, the uniform pricing does not necessarily arise. Thus, the market structure of integrated markets is provided with the aspects of both segmented and integrated markets in the presence of tariff. The analysis leads to interesting insights into economic integration.

We have mainly focused on the effects of economic integration on consumer prices. Whether consumers benefit from economic integration or not crucially depends on the shape of MC, the curvature of the demand curves, the presence of trade tax, the existence of non-integrated countries. Although we have obtained a number of results, Table 1 shows particularly interesting outcomes.

In the two-country model, economic integration under free trade could benefit or harm all the consumers with decreasing MC. This result cannot be obtained with non-decreasing MC. If MC is constant or increasing, consumers in one country gain but consumers in the other country lose. In the presence of tariff, however, economic integration accompanied by a tariff-reduction could benefit all the consumers even with increasing MC.

The three-country model is useful to examine not only the robustness of the results in the two-country model but also the effects of economic integration on the non-integrated country. The results obtained in the two-country model are fairly robust. For example, economic integration under free trade may harm or benefit the consumers in the integrated countries with decreasing MC. In this case, in fact, the consumer price in the non-integrated country moves in the same direction as in the integrated country. We have also shown a new result which is not obtained in the two-country model. That is, economic integration accompanied by a tariff-reduction may harm the consumers in the integrated countries even

with increasing MC. When the consumers in the integrated countries lose, those in the non-integrated country gain.

In concluding this paper, two final remarks are in order. First, as Krugman (1991) emphasizes, the formation of economic integration may considerably affect the levels of tariff. In particular, countries may pursue the optimal tariffs. For example, economic integration between countries 1 and 2 may affect the tariff level imposed by country 3. Although this kind of endogenous trade tax formation certainly makes the analysis much more complicated, it is worth examining.

Second, we have specifically focused on the monopoly in our study. Although Ishikawa (2000) deals with a similar issue in an oligopoly model, it is worthwhile to build alternative models to examine the issue. In particular, economic integration is likely to generate pro-competitive effects under oligopoly. Further extensions along these remarks are left for the future research.

Appendix

This appendix shows that Lemmmas 1 and 2 are still valid in the three-country model and that Lemma 7 holds.

First, we prove Lemma 1 in the three-country model. We assume $p_1^{Sf} \geq p_2^{Sf}$ without loss of generality. The lemma is trivial if $p_1^{Sf} = p_2^{Sf}$. Thus, we consider the case where both $p_1^{Sf} > p_2^{Sf}$ and $C'' \geq 0$ hold. We evaluate

$$\frac{d\Pi^I(p^I, p_3(p^I))}{dp^I} = [D_1 + (p^I - C')D_1'] + [D_2 + (p^I - C')D_2'] \tag{39}$$

at $p^I = p_1^{Sf}$ and $p^I = p_2^{Sf}$. If both $(d\Pi^I/dp^I)|_{p^I=p_1^{Sf}} < 0$ and $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} > 0$ hold, then we have $p_2^{Sf} \leq p^{If} \leq p_1^{Sf}$.

We first examine the sign of (39) at $p^I = p_1^{Sf}$. When $C'' = 0$, it is obvious that the sign of the first bracket is zero and that of the second bracket is negative. Thus, $(d\Pi^I/dp)|_{p^I=p_1^{Sf}} < 0$ holds. When $C'' > 0$, we need to check a change in the MC to determine the sign of (39). Noting $D_1(p_1^{Sf}) + D_2(p_1^{Sf}) < D_1(p_1^{Sf}) + D_2(p_2^{Sf})$, $x_3|_{p^I=p_1^{Sf}} > D_3(p_3^{Sf})$ holds with $C'' > 0$ where $x_3|_{p^I=p_1^{Sf}}$ is the supply to country 3 when $p^I = p_1^{Sf}$. However, $D_1(p_1^{Sf}) + D_2(p_1^{Sf}) + x_3|_{p^I=p_1^{Sf}} < D_1(p_1^{Sf}) + D_2(p_2^{Sf}) + D_3(p_3^{Sf})$ holds.[24] This implies that MC evaluated at $p^I = p_1^{Sf}$ is less than that that under segmented markets. Thus, the sings of both brackets in (39) are negative evaluated at $p^I = p_1^{Sf}$. Similarly, we can show that $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} > 0$. This completes the proof of Lemma 1 in the three-country model.

Next, we investigate Lemma 2 in the three-country model. With $C'' < 0$, a decrease in $(x_1 + x_2)$ raises the MC and lowers x_3. That is, a decrease in $(x_1 + x_2)$ is consistent with a decrease in $(x_1 + x_2 + x_3)$. Noting the proof of Lemma 1 above, it is known that MC evaluated at $p^I = p_1^{Sf}$ is greater than that under segmented markets. Thus, $(d\Pi^I/dp^I)|_{p^I=p_1^{Sf}} > 0$ may hold. If this is the case, $p^{If} > p_1^{Sf}$. Similarly, $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} < 0$ and hence $p^{If} < p_2^{Sf}$ may hold. Thus, Lemma 2 also holds in the three-country model.

Last, we show Lemma 7. We let p_A and p_B denote the price indicated by points A and B, respectively, in Figure 1 (a). Suppose that $(x_1 + x_2)$ at B is smaller than that at S. Then, as in the proof of Lemma 1 above, $(d\Pi^I/dp^I)|_{p^I=p_B} < 0$. Since $(d\Pi^I/dp^I)|_{p^I=p_2^{Sf}} > 0$ is shown to hold above, point I is between B and D in this case. Similarly, suppose that $(x_1 + x_2)$

[24] Otherwise, x_3 must fall in view of (4).

at A is larger than that at S. Then $(d\Pi^I/dp^I)|_{p^I=p_A} > 0$ and $(d\Pi^I/dp^I)|_{p^I=p_1^{Sf}} < 0$ hold. In this case, thus, point I is between A and C. Thus, Lemma 7 holds.

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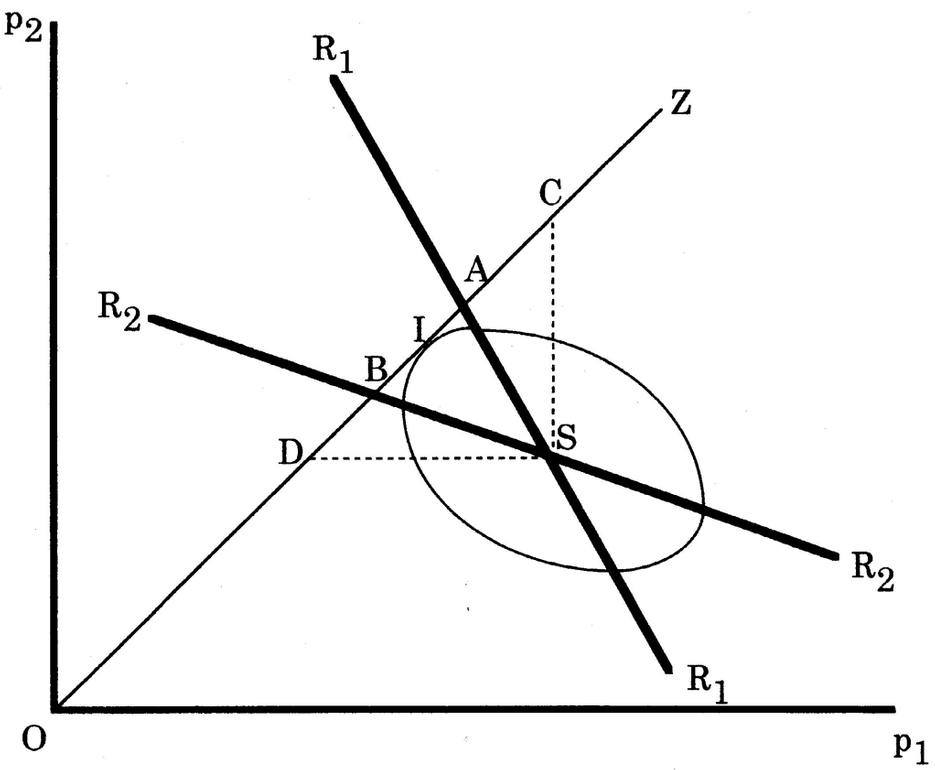
Figure 1: Economic integration under free trade

(a) C"<0



(b) C"<0

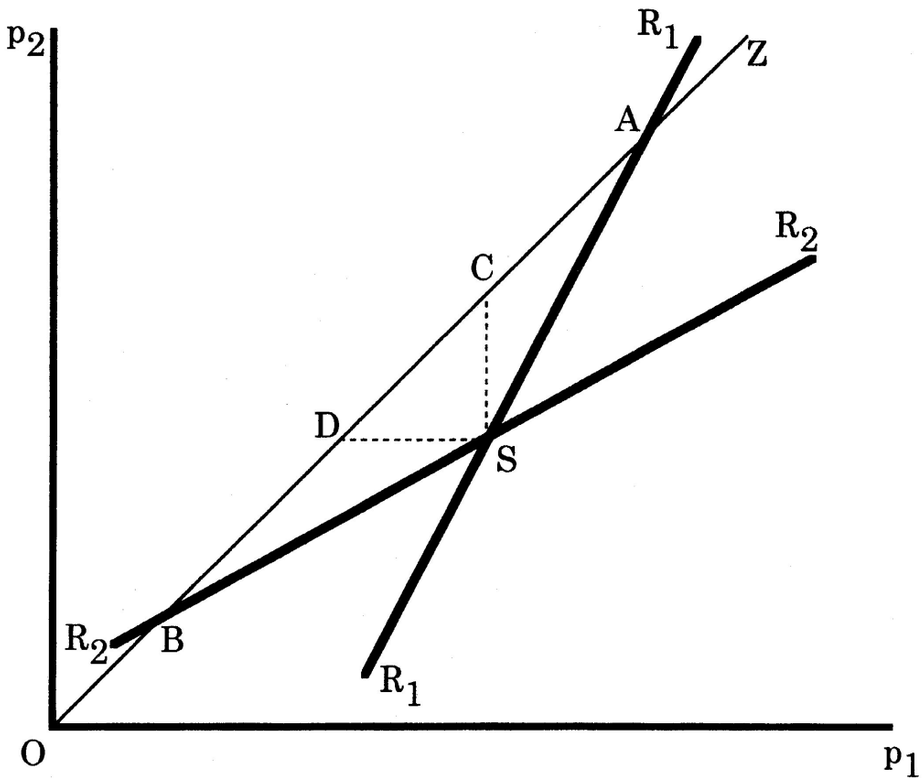


Figure 2: MR curves under segmented and integrated markets

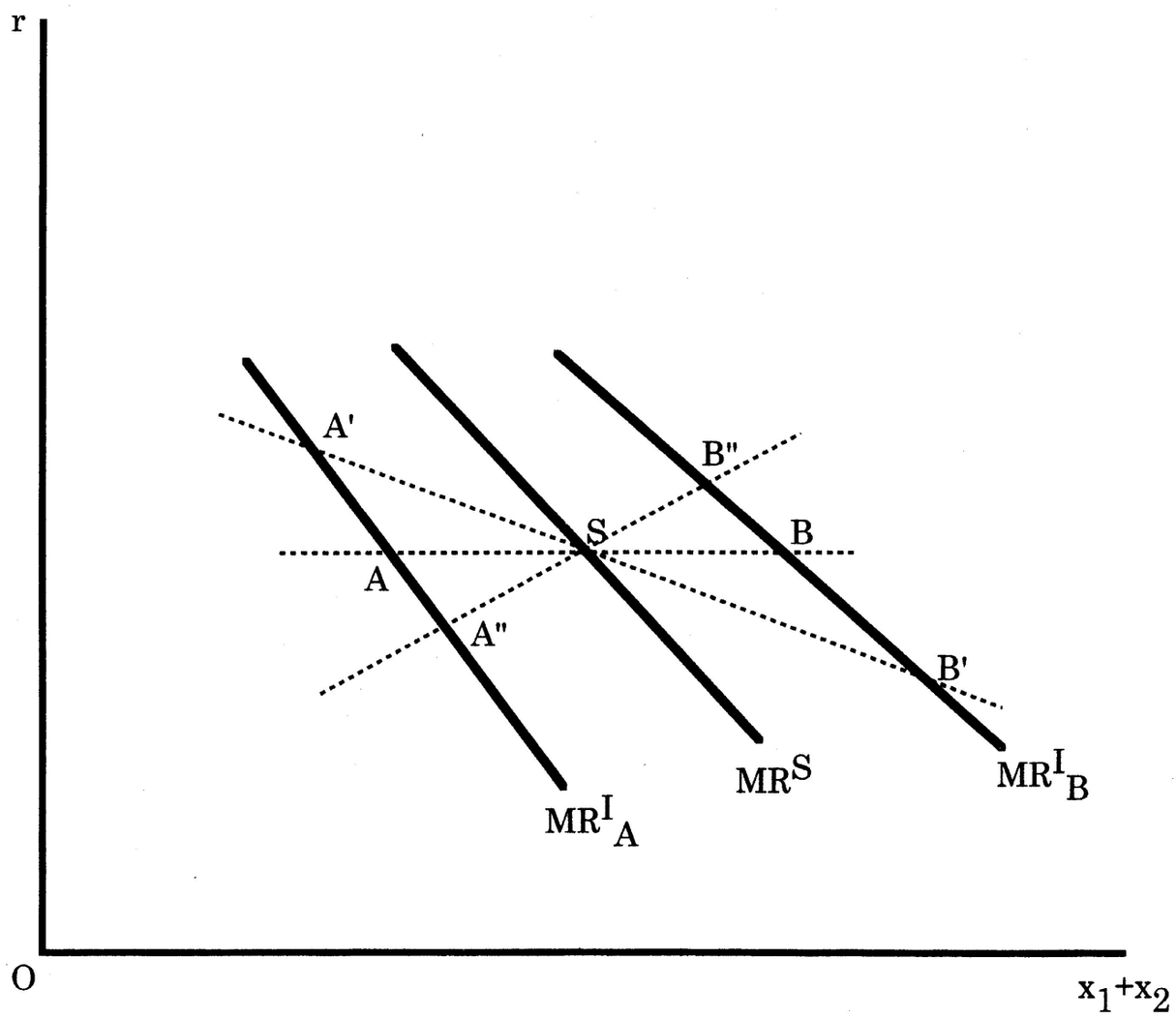
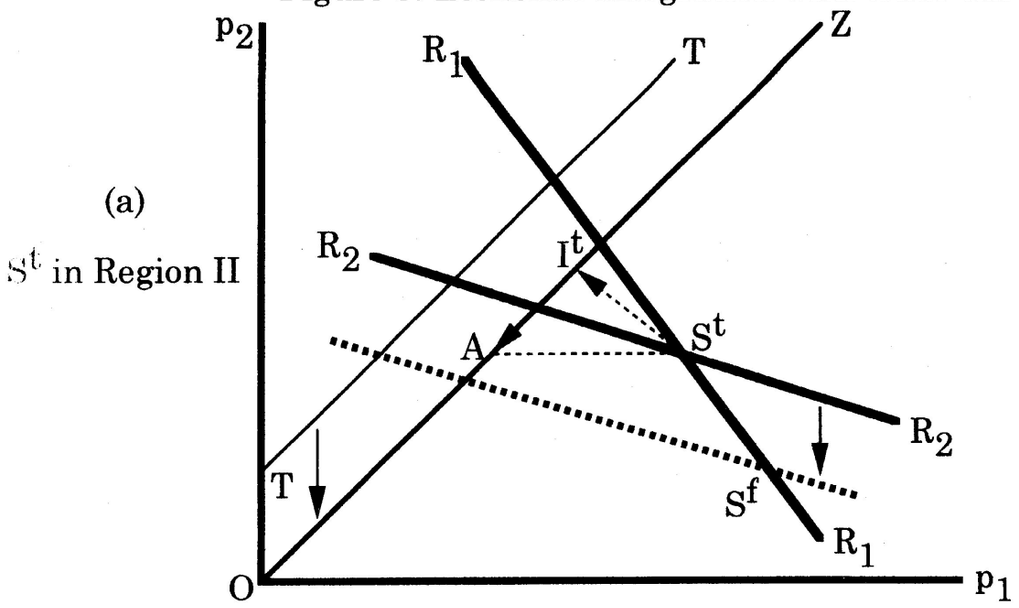
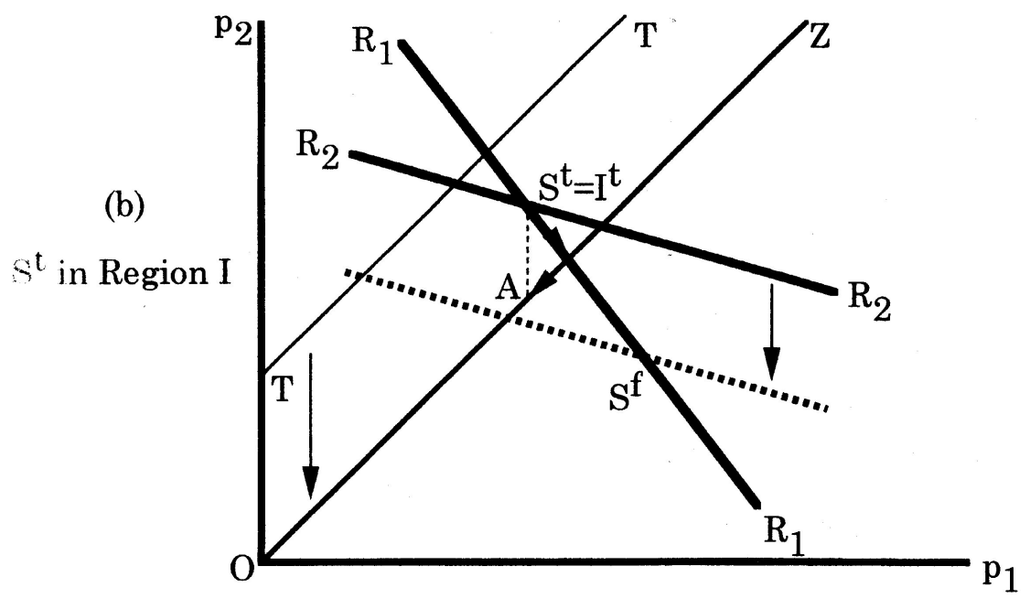


Figure 3: Economic integration with trade tax





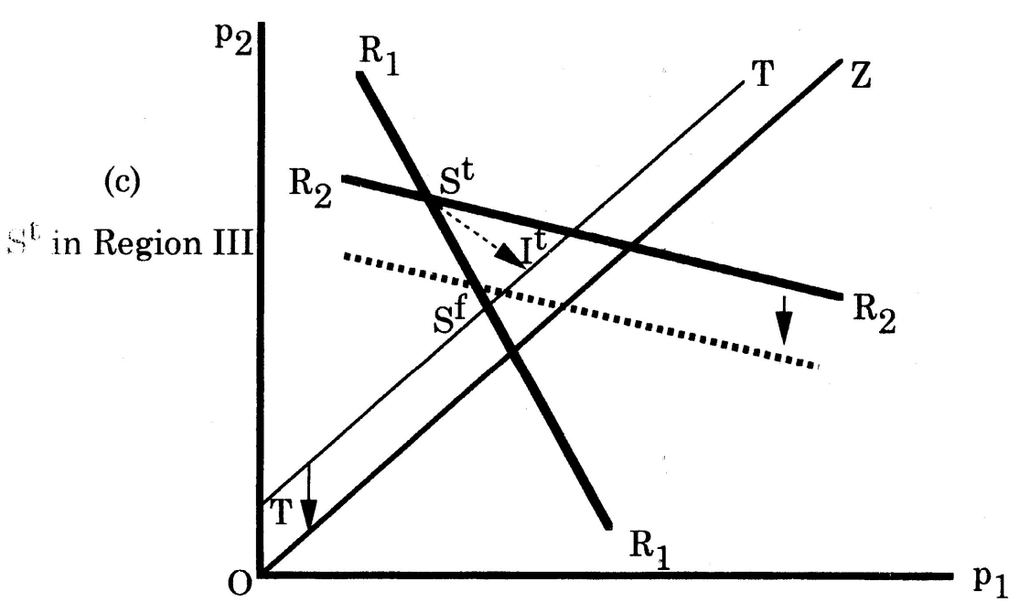
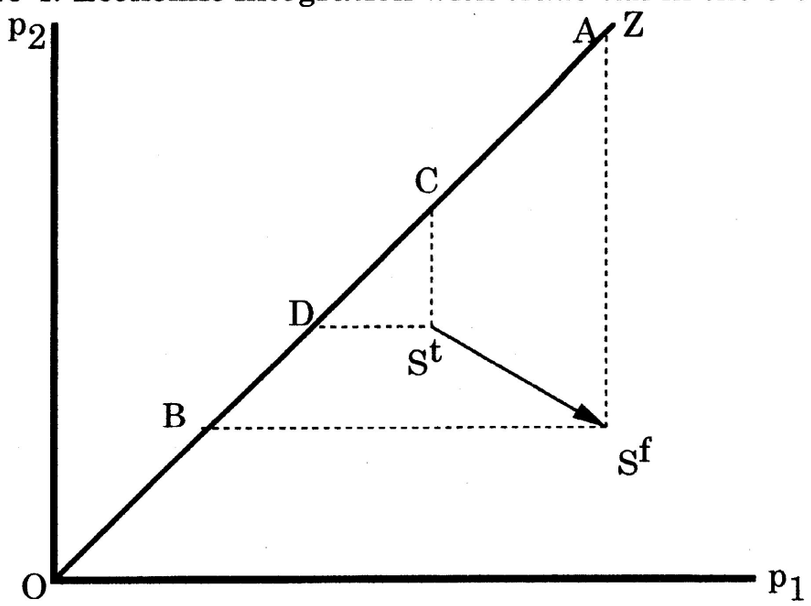
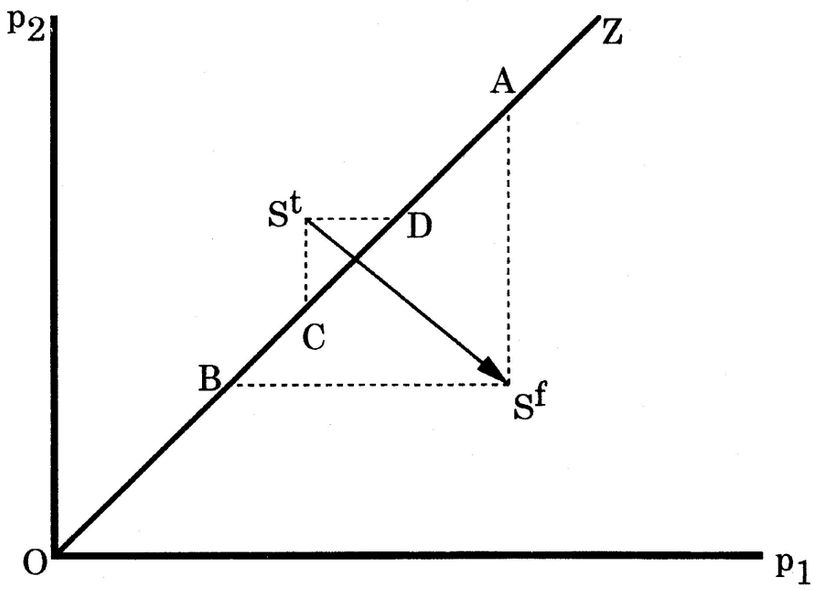


Figure 4: Economic integration with trade tax in the 3-country model

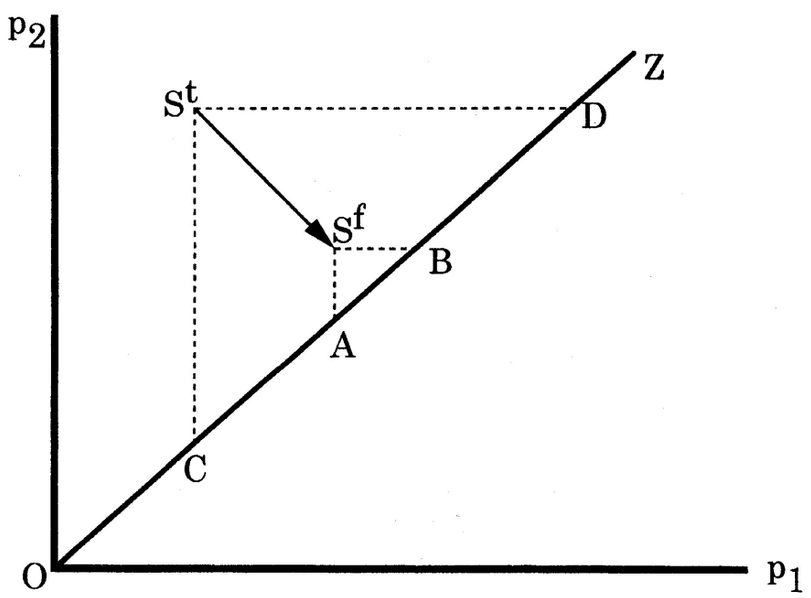
(a)



(b)



(c)



◆2-country model

economic integration with	consumers in country 1	consumers in country 2
free trade & C"<0	○	○
	×	×
tariff & C">0	○	○

◆3-country model (economic integration between countries 1 & 2)

economic integration with	consumers in country 1	consumers in country 2	consumers in country 3
free trade & C"<0	○	○	○
	×	×	×
tariff & C">0	○	○	×
	×	×	○

○ means that consumers gain from economic integration.

× means that consumers lose from economic integration.

Table 1: Interesting results